EPA/ROD/R03-00/012
2000

EPA Superfund
Record of Decision:

NAVAL AIR DEVELOPMENT CENTER (8 WASTE AREAS)
EPA ID: PA6170024545
OU 10
WARMINSTER TOWNSHIP, PA
06/20/2000

Department of the Navy

Record of Decision for OU-8

Naval Air Warfare Center

Warminster, Pennsylvania **June 2000**

THE DECLARATION

SITE NAME AND LOCATION

Naval Air Development Center
Soils in Area D (Operable Unit 8)
Warminster, Pennsylvania
CERCLIS ID # PA6170024545

STATEMENT OF BASIS AND PURPOSE

This decision document presents the determination that no action is necessary for soils in Area D (Operable Unit 8), at the Naval Air Development Center ("the Site") in Warminster, Pennsylvania. This determination has been made in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this Site.

In 1993, the Site was renamed the Naval Air Warfare Center (NAWC) Aircraft Division. NAWC was disestablished on September 30, 1996 and is targeted for transfer to the private sector.

The Commonwealth of Pennsylvania, as represented by the Pennsylvania Department of Environmental Protection (PADEP), concurs with the selected remedy for OU-8 at the Site.

DESCRIPTION OF THE SELECTED REMEDY

A no action alternative is the selected remedy for OU-8 at the Site. OU-8 consists of soils in Area D.

STATUTORY DETERMINATIONS

The no action remedy selection is based upon a remedial investigation of OU-8 which indicates that no action is necessary at OU-8 to be protective of human health and the environment. A five-year review will not be necessary for OU-8.

Thomas C. Ames
BRAC Environmental Coordinator
Naval Air Warfare Center
Warminster, Pennsylvania

6/14/00
Date

Abraham Ferdas, Director
Hazardous Site Cleanup Division
U.S. EPA - Region III

6/20/00
Date

DECISION SUMMARY

I. SITE NAME, LOCATION, AND DESCRIPTION

The former Naval Air Development Center is located in Warminster Township and Ivyland Borough, Bucks County, Pennsylvania. The National Superfund electronic database identification number for the Naval Air Development Center is PA6170024545. The Naval Air Development Center was renamed the Naval Air Warfare Center (NAWC) Aircraft Division in January 1993 and was disestablished on September 30, 1996, in response to the requirements of the Base Realignment and Closure Act (BRAC). The Department of the Navy is the lead agency and EPA the support agency of CERCLA activities at NAWC. The Department of Defense is the source of cleanup monies for NAWC. Soils in Area D have been identified as Operable Unit 8 at NAWC and are addressed by this ROD. Remedial investigations of groundwater at the Site determined that releases of hazardous substances to groundwater may have occurred within Area D. The groundwater contamination of concern has been defined as Area D groundwater and is being addressed under Operable Unit 4.

II. SITE HISTORY AND ENFORCEMENT ACTIVITIES

A. Site History

NAWC is an 824-acre facility located in Warminster Township, Northampton Township and Ivyland Borough, Bucks County, Pennsylvania (see Figure 1 for Site Location Map). As a result of the Base Realignment and Closure Act (BRAC), NAWC ceased operations on 30 September 1996. The majority of NAWC, including Area D, is being transferred to the private sector.

The facility lies in a populated suburban area surrounded by private homes, commercial and industrial activities, and a golf course. On-base areas include various buildings and other complexes connected by paved roads, the runway and ramp area, mowed fields, and a small wooded area.

The property was originally owned by Brewster Aeronautical Corporation, which manufactured aircraft at the facility until July 1944, when the Navy purchased the facility. Aircraft manufacturing and modification remained the primary mission at the base until 1949.

After 1949, the overall mission of the base underwent a change from a manufacturing operation to a research and development operation. Those activities varied over the years, but they included the development research, and testing of aircraft components, coatings electronics, and control devices. Concurrent with these activities, aircraft continued to be used and maintained.

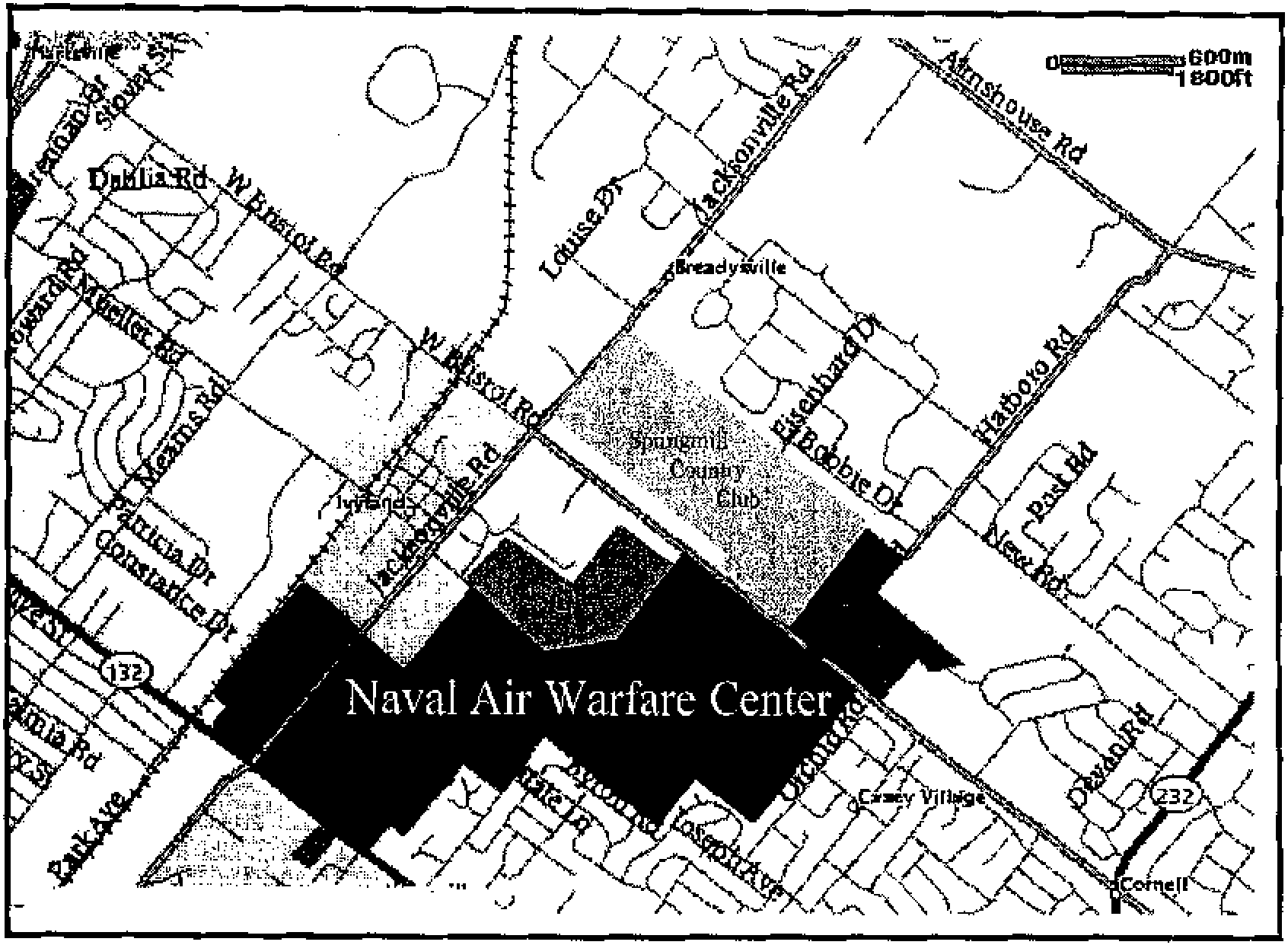


Figure 1. The former NAWC, Warminster, PA

NAWC also conducted studies in anti-submarine warfare systems and software development. Historically, wastes were generated during aircraft maintenance and repair, pest control, fire-fighting training, machine and plating shop operations, spray painting, and various materials research and testing activities in laboratories.

The generated wastes included paints, solvents, sludges from industrial wastewater treatment, and waste oils that were disposed in several pits, trenches, and landfills throughout the facility property.

NAWC was listed on the Superfund National Priorities List (NPL) in 1989. This list comprises sites where uncontrolled hazardous substance releases present the most significant potential threats to human health and the environment.

Areas reported by the Navy to have been potentially used for disposal of hazardous substances include eight locations covering more than 15 acres. These locations include:

- Three waste disposal locations (Sites 1, 3, and 6)
- Two sludge disposal pit locations (Sites 2 and 7)
- Two landfills (Sites 4 and 5)
- One fire training location (Site 8)

These disposal locations have since been grouped within the following areas on NAWC property: Area A (Sites 1, 2, and 3); Area B (Sites 5, 6, and 7); and Area C (Sites 4 and 8). Figure 2 provides the location of these areas.

Area D includes the majority of NAWC property west of Jacksonville Road (see Figure 2). Area D was not reported as a disposal area, but it was identified as an area where contaminant releases to groundwater may have occurred and impacted groundwater now being addressed under OU-4.

The largest buildings in Area D are Buildings 1 and 2 (see Figure 3). Brewster Aeronautical Corporation, the owner of the property before the Navy, constructed both buildings as aircraft hangers in 1942. The laboratories necessary to support the research and development operations were constructed within Buildings 1 and 2. Numerous other support facilities were also constructed throughout Area D.

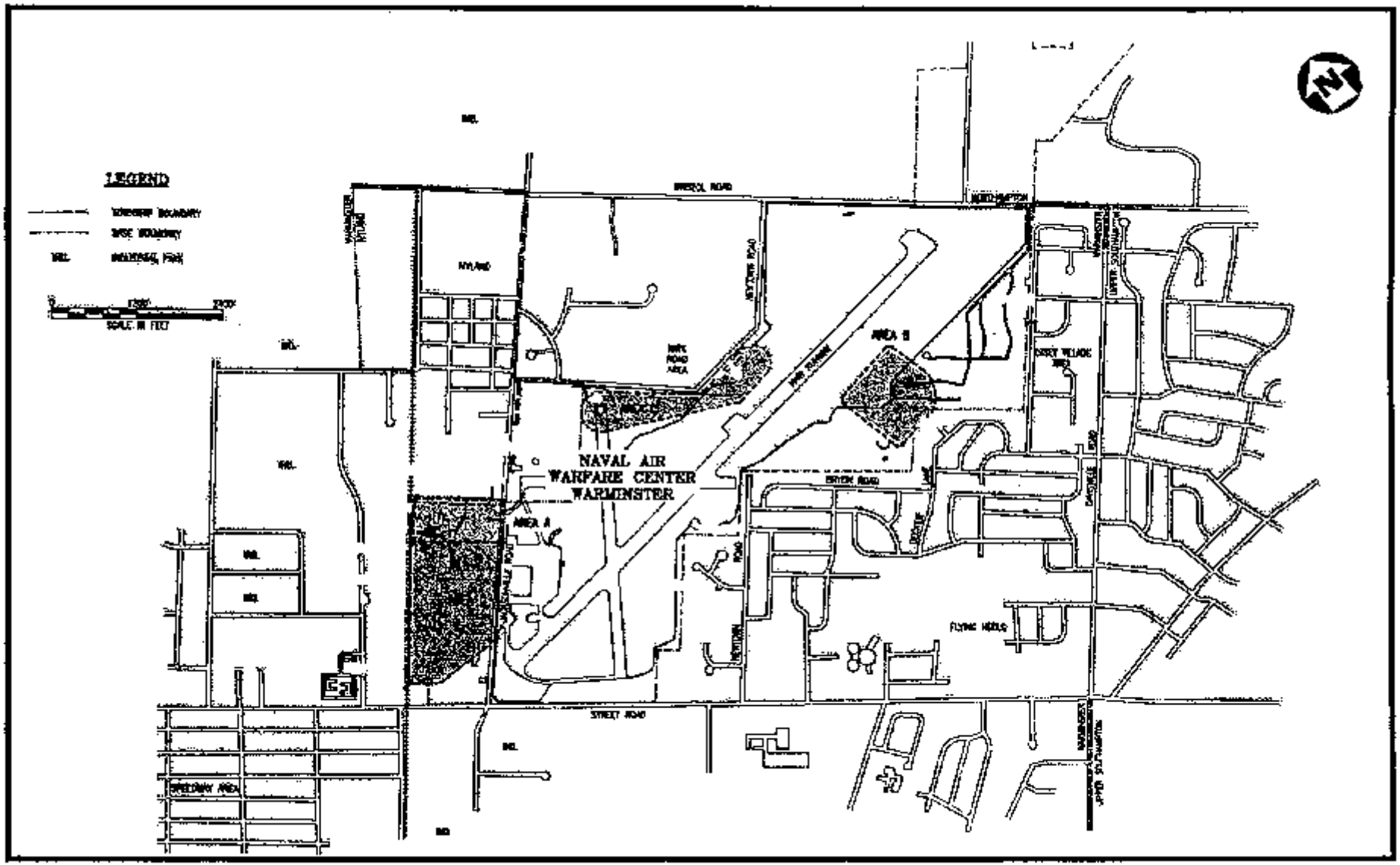
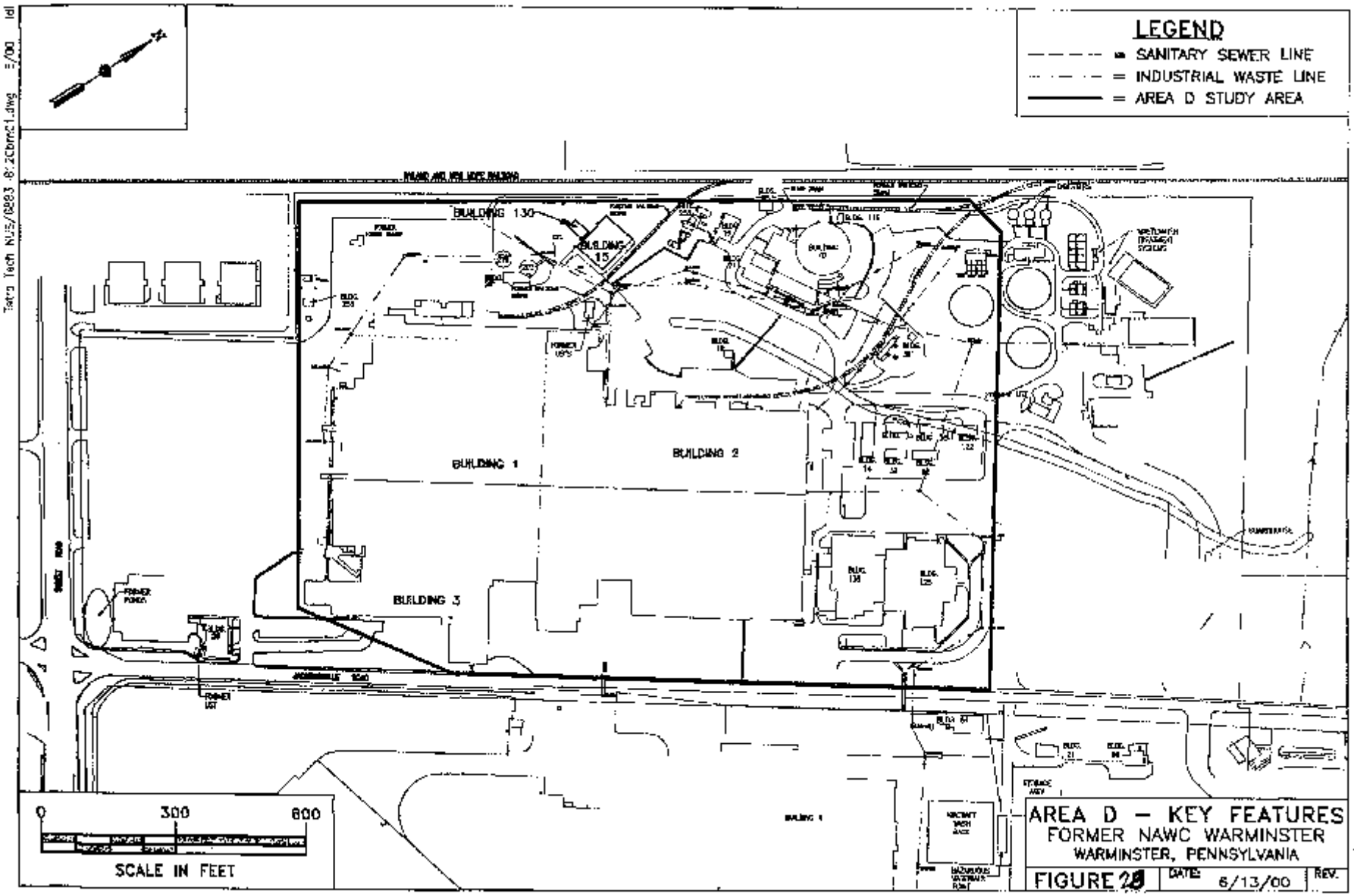


Figure 2 – NAWC Site Location Map


LEGEND
= SANITARY SEWER LINE
= INDUSTRIAL WASTE LINE
= AREA D STUDY AREA
BUILDING 130
BUILDING 15
BUILDING 1
BUILDING 2
BUILDING 3
0
300
600
SCALE IN FEET
AREA D – KEY FEATURES
FORMER NAWC WARMINSTER
WARMINSTER, PENNSYLVANIA
FIGURE 2-8
DATE: 6/13/00
REV.

During the period that aircraft were assembled at the facility, the main assembly line, including parts fabrication and finishing, was located within Building 1. Parts storage and subassembly lines occupied much of Building 2. The fabrication, finishing and assembly of parts and aircraft involved several metal shops where parts were formed, treated, plated and/or painted. During this operation about 800 machine and miscellaneous metal forming tools were used including drillers, grinders, millers, lathes, presses, power saws, riveters, drop hammers, and mandrels. Other production equipment involved numerous items such as anodizing equipment, tumbling barrels, cadmium-plating equipment, demagnitizers, degreasers, leverage presses, melting pots, paint spray booths, sanders, furnaces, spot welding equipment, quench tanks, air compressors, and blat cabinets, along with laboratory and testing equipment.

During the initial years of operations, liquid wastes generated within Area D Area were conveyed via sewer lines to an on-base wastewater treatment plant built by Brewster and the Navy. The wastewater treatment plant accepted both sanitary and industrial wastes from the facility operations. Industrial waste water was pretreated before it entered the sanitary wastewater treatment plant. The treatment plant, which was operated by the Navy until base closure, is located to the north of Area D within the section of the base referred to as Area A. Waste collection and transfer lines serving the main building complex and the associated support buildings are located throughout Area D. Solid and liquid wastes containing hazardous substances generated within Area D prior to the effect of the Resources Conservation and Recovery Act may have been disposed at one or more of the reported disposal sites referenced above.

As indicated above, the use of the main building complex and the overall mission of base underwent a change in 1949 from a manufacturing operation to a research and development operation. Research and development activities varied over the years, but they included the development and testing of aircraft components, coatings research, electronics, and control devices.

Information regarding the nature and quantity of hazardous materials used and hazardous wastes generated within Area D prior to the effect of the Resources Conservation and Recovery Act (RCRA) is very limited. As noted above, available information does indicate that aircraft assembly operations included the plating of metal aircraft components. The plating operations were conducted in the far western portion of Building 1 and included a trichloroethylene (TCE) bath and rinse for cleaning components, plating with zinc and cadmium, and a cyanide bath/rinse of the finished product.

In response to the requirements of RCRA, in 1985, the Navy first identified, in comprehensive fashion, the nature and quantity of hazardous wastes being generated at NAWC and within Area D. This information was provided in RCRA “Part B” permit applications submitted to EPA for the generation and storage of

hazardous waste at NAWC. The permit application indicated the nature and quantity of hazardous waste being generated within Area D in 1985. This and subsequent available information regarding hazardous waste generation and storage has been reported in Environmental Baseline Survey documents prepared by the Navy in response to the requirements of the Base Realignment and Closure Act (BRAC) and Section 120(h) of CERCLA and to support Findings of Suitability to Lease (FOSLs) for property within Area D. These documents indicate a variety of hazardous wastes were being generated within Area D and Buildings 1 and 2. The application also reported that hazardous wastes generated at NAWC would be stored for 90 days or more in Buildings 15 and 130, which are located within Area D, prior to transport offsite for treatment/disposal.

B. Enforcement Actions

No enforcement actions have been taken at Operable Unit 8. The Navy has owned the property since 1944 and is identified as the responsible party. NAWC was added to the National Priorities List (NPL) in 1989. The NPL is a list of the most contaminated hazardous waste sites in the United States.

III. REMEDIAL INVESTIGATIONS

Groundwater investigations in Area D began in the late 1970s when trichloroethene (TCE) was identified in two on-base supply wells located within Area D.

From 1994 to 1997, RI work investigating hazardous substance releases within Area D focused on groundwater. The interim RI report for Area D groundwater indicated that groundwater contamination was likely to be attributable to releases in Area D. The general locations of Buildings 1 and 2 were identified as potential contaminant sources. The primary groundwater contaminant of concern was TCE, a chlorinated volatile organic compound (VOC). In September 1997, a ROD was issued for OU-4 that selected pumping and treating contaminated Area D groundwater as an interim remedy while investigations continued to determine the full nature and extent of the contamination of concern.

RI work addressing soils within Area D was initiated in 1996. The primary objective of the RI was to identify potential sources of Area D groundwater contamination. Other potential locations of contaminant releases within Area D were investigated by the Navy as part of an Environmental Baseline Survey (EBS), conducted in response to the requirements of BRAC and CERCLA Section 120(h). Initial stages of the RI included the review of background information, including EBS reports, building plans and use history, sewer line plans and maintenance/repair information, and RCRA hazardous waste generation/storage records, to identify locations where contaminants may have been released to groundwater.

RI field work consisted of soil gas surveys to detect chlorinated VOCs (including TCE), soil borings, and soil sampling. Soil gas surveys addressed areas outside of the buildings. The results of these surveys were used to select exterior soil boring and sample locations. Exterior soil gas stations were located and subsurface soil samples were taken along sewer lines, loading docks, railroad spurs and drainage ways. Field investigations beneath buildings consisted of a more limited number of soil borings and soil samples under Building 1 and 2. The locations of these interior borings/samples; considered information regarding hazardous waste generation and the location of sewer lines.

Surface soils were sampled at Buildings 15 and 130, where hazardous waste storage was permitted under RCRA.

IV. HIGHLIGHTS OF COMMUNITY PARTICIPATION

In accordance with Sections 113 and 117 of CERCLA, the Navy provided a public comment period from May 1, 2000 through May 30, 2000 for the No Action Determination described in the Proposed Plan for OU-8.

The Proposed Plan along with the Remedial Investigation Report for Area D Sources Other Than Groundwater were available to the public in the Administrative Record and information repositories maintained at the Navy Caretaker Site Office located at 860 Flamingo Alley Warminster, Pennsylvania or at the Bucks County Library located at 150 South Pine Street, Doylestown, Pennsylvania. Public notice was provided in the *Bucks County Courier Times*, *Philadelphia Inquirer*, and *Intelligencer* and a public meeting was held May 11, 2000 at the North American Technology Center located at 626 Jacksonville Road in Warminster, Pennsylvania.

V. SCOPE AND ROLE OF OPERABLE UNIT

Section 300.430 (a) (1) (ii) (A) of the NCP, 40 C.F.R. Section 300.340 (a) (1) (ii) (A) provides that CERCLA NPL sites “should generally be remediated in operable units when early actions are necessary or appropriate to achieve significant risk reduction quickly, when phase analysis or response is necessary or appropriate given the size or complexity of the site, or to expedite the completion of a total cleanup.” In the case of NAWC Warminster, the Navy has organized work to date into eight operable units (OUs). These OUs are as follows.

- OU-1: Area A and Area B groundwaters
- OU-2: Off-base private wells
- OU-3: Area C groundwater

- OU-4: Area D groundwater
- OU-5: Soil, sediment, and surface water at Site 8
- OU-6: Soil, sediment, and surface water at Site 4
- OU-7: Soil and wastes at Sites 6 and 7
- OU-8: Soils at Area D

The Navy and EPA selected an interim remedy for OU-1 in a ROD signed on September 23, 1993, and the removal action for OU-2 was selected by EPA in a Removal Action Memorandum signed on July 14, 1993. The Navy and EPA selected a final remedy for OU-3 in a ROD signed on March 19, 1995. In September 1999, the Navy and EPA determined that institutional controls were necessary to prevent the use of Area C groundwater presenting an unacceptable human health risk and to protect the long-term effectiveness of the OU-3 remedy. An Explanation of Significant Differences (ESD) was signed to make changes to the OU-3 ROD. The institutional controls address portions of Area C (including Sites 4 and 8) on both current Navy and private property, and consist of restrictions on the use of water from existing wells, restrictions on the future installation of wells, and restrictions on the use of wells installed in the future. An interim remedy for OU-4 was selected in a ROD signed by the Navy and EPA on September 30, 1997. A no further action ROD for OU-5 was signed by the Navy and EPA on September 30, 1999, while a Proposed Plan of no further action was issued for OU-6 on February 16, 2000. A Proposed Plan for OU-7 was also issued on February 16, 2000 and the RODs for both OU-6 and OU-7 are forthcoming. The selected remedies for OU-1, OU-3, and OU-4 are all operational at this time, and the removal addressing OU-2 has been completed.

A Proposed Plan was issued for OU-8 on May 1, 2000. This ROD documents the selected remedy for OU-8. OU-8 consists of soils located within Area D at the Site. This ROD documents a No Action determination for Area D soils based on the results of the RI and baseline risk assessment.

VI. REMEDIAL INVESTIGATION RESULTS

A. Soil Gas Sampling

A total of 586 soil gas samples were collected throughout Area D. The primary objective of the soil gas samples was to determine the nature and extent of any soil contamination which may be actively contributing to TCE (or other VOC) levels in Area D groundwater. Figure 3 indicates the areas where the soil gas samples were collected. The soil gas survey focused primarily on exterior sewer lines, loading dock areas, current and former surface drainage pathways and the vicinity of Buildings 15 and 130.

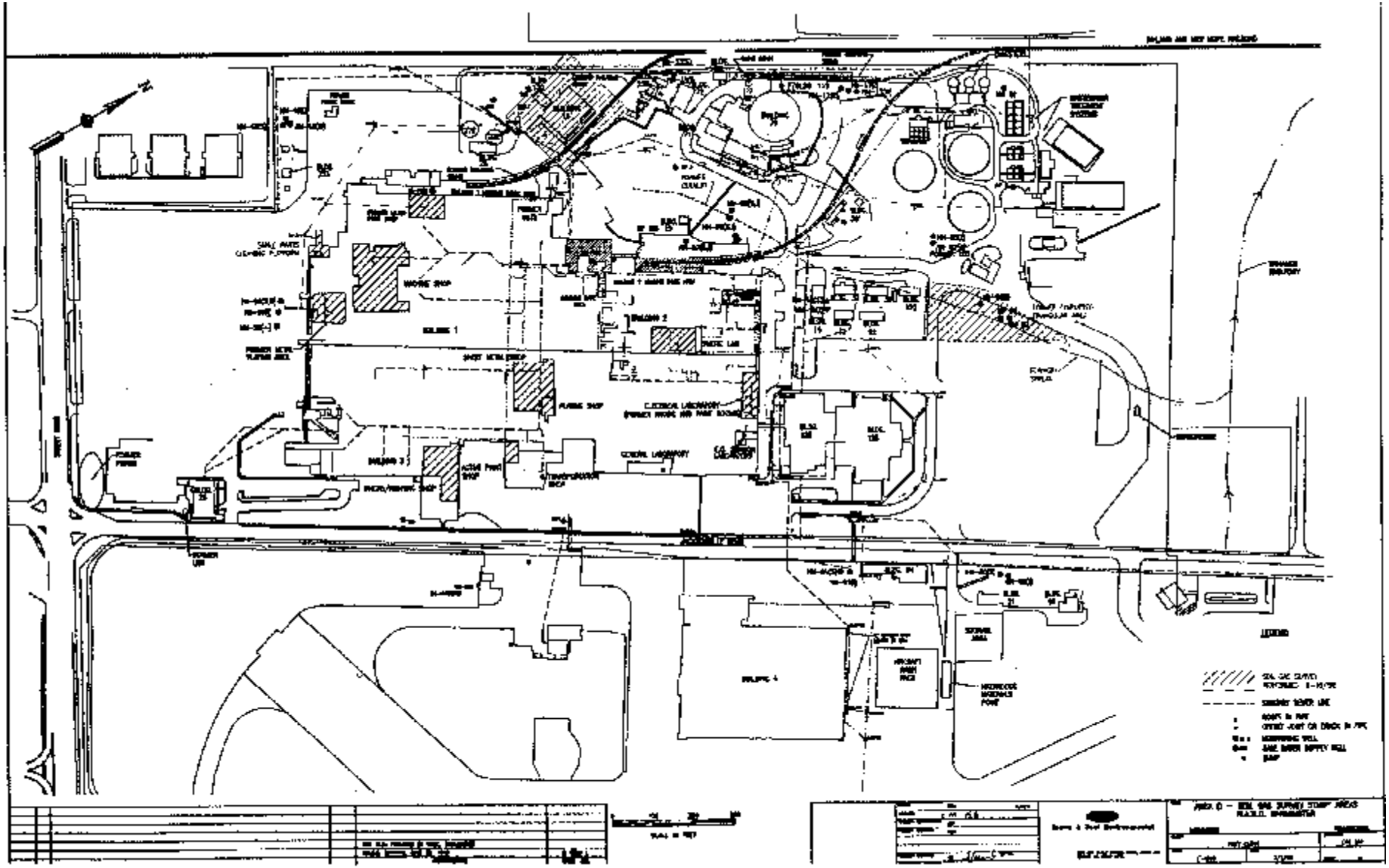


FIGURE 3

Samples along linear features such as sewer lines were generally collected every 25 feet. Three samples were collected within 5 feet of each manhole. In the case of areal features, samples were collected from grids with 25 to 100 foot spacing. Additional soil gas samples were collected around soil gas stations where target VOC levels in soil gas (see below) exceeded 20 ug/l. The majority of the soil gas samples were collected at 6 feet in depth, with the range of sample depths varying from 3 to 8 feet No soil gas samples were collected below buildings or sewer lines. Soil gas samples were analyzed onsite by gas chromatography and electron capture detection. Instrumentation was optimized for the detection of VOCs identified as potential Area D groundwater contaminants, including TCE, tetrachloroethene (PCE), 1,1,1-trichloroethane (1,1,1-TCA), 1,1-dichloroethene (1,1-DCE), cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-dichloroethene (trans-1,2-DCE), 1,2-dichloroethane (1,2-DCA) and 1,1,-dichloroethane (1,1-DCA). These VOCs were either known to be contaminants of concern in Area D groundwater or otherwise had been detected in Area D or Area A groundwater.

Since there are no known soil gas criteria indicative of unacceptable VOC levels in soils, detected soil gas levels were evaluated on a site-specific basis to identify where VOC concentrations in soils may be elevated. The highest and most consistent levels of the target VOCs were identified in soil gas along the industrial sewer line which conveyed wastewater from the former metal plating shop to treatment plant. In this case, VOC levels exceeding 100 ug/l were detected along a 100 foot interval of a sewer line approximate 150 feet west of Building 1, the approximate location of a sewer line break reportedly repaired in the 1970's. There were also multiple detections of target VOCs at levels above 100 ug/l near a stormwater collection grate and stormsewer next to Buildings 15 and 130. In this case the elevated detections were detected along a 50 foot interval of the storm sewer.

Generally, VOCs were detected throughout the balance of the area surveyed at concentrations ranging from 0.3 to over 100 ug/l. However, the two cases referenced above are the only instances where target VOCs exceeded 100 ug/l in more than one sample location within an area.

B. Subsurface Soil Sampling

A total of 111 subsurface soil locations were sampled during the RI. Subsurface soil samples were collected at locations with target VOC levels greater than 20 ug/l in soil gas and at other features of concern identified during the RI. Samples along sewer lines averaged more than four feet in depth (the average depth of the sewer lines) and generally were located within 5 to 10 feet of the sewer line. Other sample depths varied from two to ten feet. Twenty-one locations below Buildings 1 and 2 were sampled. The locations of these interior soil samples considered information regarding the RCRA hazardous waste generation and the estimated location of interior sewer lines. Since a primary objective of the RI was to identify any active sources of VOCs in groundwater, all subsurface soil samples were analyzed for VOCs.

In addition, all but 4 samples were analyzed for metals and approximately 48% of the samples were analyzed for semi-volatile organic compounds, pesticides and polychlorinated biphenyls (PCBs).

Table 1 provides the occurrence and distribution of organics detected in Area D subsurface soils, while Table 2 provides this information for subsurface soils at Buildings 15 and 130. TCE, the primary constituent of concern in Area D groundwater, was detected in 38 out of 108 of these subsurface soil sample locations. However, the maximum level of TCE detected was 18 ug/kg, substantially less than the EPA soil screening level, 60 ug/kg, for the protection of groundwater. Other VOCs that have also been found in Area D groundwater included PCE (28 out of 126 locations) and 1,2-DCE (10 out of 126 locations). The maximum detected PCE level, 12 ug/kg, was well below the EPA soil screening level of 60 ug/kg for the protection of groundwater. Similarly, the maximum detected 1,2-DCE level of 5 ug/kg is significantly below the EPA soil screening level of 60 ug/kg for the protection of groundwater. Table 3 shows the EPA soil screening levels for the protection of groundwater for Area D groundwater contaminants of concern and compares these soil screening levels to the calculated representative concentration for each soil data set collected within Area D. Benzo(a)pyrene was the only organic compound detected in subsurface soils at a level which exceeds EPA soil screening levels protective of residential use. Benzo(a)pyrene was detected in 10 out of 66 samples collected from Area D and detected at a maximum concentration of 620 ug/kg.

Table 4 provides the occurrence and distribution of inorganics, detected in Area D subsurface soils, while Table 5 provides this information for subsurface soils at Buildings 15 and 130. Beryllium and vanadium were the only inorganics detected at levels above background and at levels exceeding EPA soil screening criteria protective of residential land use. The maximum detected concentrations of beryllium and vanadium were 4.4 mg/kg and 48.5 mg/kg, respectively.

Despite the exceedances of screening levels discussed above, the Summary of Site Risks section to follow explains why it was determined that no organic or inorganic contaminants of concern (COCs) have been identified in subsurface soils within Area D. In addition, observations during the performance of the soil borings did not suggest any disposal activities or areas of substantial releases of CERCLA hazardous substances.

C. Surface Soils

Based on the historical use of Buildings 15 and 130 for the storage of hazardous wastes, two separate surface soil sampling events were performed. During the initial sampling effort, samples were collected from a depth of 2 to 3 feet below the ground surface at seven locations. All of the samples were analyzed for VOCs, semi-volatile organic compounds and pesticides/PCBs. Five of the samples were

TABLE 1

OCCURRENCE AND RANGE OF ORGANICS IN SUBSURFACE SOIL AT AREA D
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
(ug/kg)

	BACKGROUND			SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
1,1,1-TRICHLOROETHANE	0 / 20	-	-	1 / 126	2.00	IW-SB-102-04	NONPARAMETRIC DIST	6.70	2.00
1,2-DICHLOROETHENE (TOTAL)	0 / 20	-	-	10 / 126	1.00 - 5.00	IW-SB-220-10	NONPARAMETRIC DIST	6.44	5.00
2,4-DINITROTOLUENE	0 / 11	-	-	1 / 66	250	DS-SB-07-08	NONPARAMETRIC DIST	220	227
2,BUTANONE	0 / 20	-	-	57 / 109	2.00 - 44.0	IB-SB-03-02	NONPARAMETRIC DIST	8.68	9.27
2-METHYLNAPHTHALENE	0 / 11	-	-	2 / 66	160 - 160	IB-SB-03-02	NONPARAMETRIC DIST	218	160
4,4'-DDD	1 / 22	16.0	2.92	1 / 68	8.30	IW-SB-01-03	NONPARAMETRIC DIST	20.3	2.09
4,4'-DDE	1 / 22	820	13.6	2 / 68	7.50 - 15.0	IW-SB-01-03	NONPARAMETRIC DIST	2.21	2.27
4,4'-DDT	1 / 22	1440	18.8	2 / 68	8.10 - 24.0	IW-SB-01-03	NONPARAMETRIC DIST	2.35	2.36
ACENAPHTHENE	0 / 11	-	-	2 / 66	46.0 - 130	IW-SB-213-10	NONPARAMETRIC DIST	216	130
ACENAPHTHYLENE	0 / 11	-	-	2 / 66	48.0 - 110	DS-SB-17-06	NONPARAMETRIC DIST	215	110
ACETONE	4 / 19	8 - 12.0	12.0	80 / 101	2.00 - 120	IB-SB-03-02	NONPARAMETRIC DIST	9.89	9.67
ALPHA-CHLORDANE	0 / 22	-	-	1 / 68	4.60	IW-SB-01-03	NONPARAMETRIC DIST	1.06	1.09
ANTHRACENE	0 / 11	-	-	5 / 66	52.0 - 253	IW-SB-213-10	NONPARAMETRIC DIST	213	227
AROCLOR-1254	1 / 22	51.0	39.8	1 / 68	31.0	IW-SB-01-03	NONPARAMETRIC DIST	19.6	19.9
AORCLOR-1260	0 / 22	-	-	3 / 68	8.80 - 24.0	IW-SB-53-06	NONPARAMETRIC DIST	19.2	19.8
BENZ(A)ANTHRACENE	0 / 11	-	-	12 / 66	39.0 - 520	EA-SB-15-05	NONPARAMETRIC DIST	222	244
BENZO(A)PYRENE	0 / 11	-	-	10 / 66	62.0 - 620	EA-SB-15-05	NONPARAMETRIC DIST	222	237
BENZO(B)FLUORANTHENE	1 / 11	58.0	58	12 / 66	40.0 - 1000	EA-SB-15-05	NONPARAMETRIC DIST	242	267
BENZO(G.H.I)PERYLENE	0 / 11	-	-	10 / 66	67.0 - 480	IW-SB-77-05	NONPARAMETRIC DIST	215	228
BENZO(K)FLUORANTHENE	1 / 11	46.0	46	10 / 66	88.0 - 370	EA-SB-15-05	NONPARAMETRIC DIST	205	215
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 11	50.0	50	43 / 66	380. - 560	IW-SB-105-09	NONPARAMETRIC DIST	192	237
BUTYLBENZYLPHTHALATE	0 / 11	-	-	6 / 66	71.0 - 8400	IB-SB-25-02	NONPARAMETRIC DIST	387	337
CARBAZOLE	0 / 11	-	-	1 / 66	140	IW-SB-213-10	NONPARAMETRIC DIST	218	140
CHRLOROMETHANE	2 / 20	3.00	3.0	1 / 124	12.0	IB-SB-02-07	NONPARAMETRIC DIST	6.79	6.73
CHRYSENE	1 / 11	51.0	51	12 / 66	47.0 - 550	EA-SB-15-05	NONPARAMETRIC DIST	227	247
DI-N-BUTYLPHTHALATE	0 / 11	-	-	7 / 66	39.0 - 53.0	PB-SB-03-05	NONPARAMETRIC DIST	203	53
DIBENZOFURAN	0 / 11	-	-	1 / 66	95.0	IW-SB-213-10	NONPARAMETRIC DIST	217	95
DIELDRIN	0 / 22	-	-	1 / 68	67.0	IW-SB-01-03	NONPARAMETRIC DIST	2.89	2.47
FLUORANTHENE	1 / 11	92.0	92	13 / 66	52.0 - 890	EA-SB-15-05	NONPARAMETRIC DIST	257	287
FLUORENE	0 / 11	-	-	2 / 66	52.0 - 140	IW-SB-213-10	NONPARAMETRIC DIST	216	140
GAMMA-CHLORDANE	0 / 22	-	-	1 / 68	5.80	IW-SB-01-03	NONPARAMETRIC DIST	1.07	1.10
INDENO(1,2,3-CD)PYRENE	0 / 11	-	-	10 / 66	49.0 - 440	EA-SB-15-05	NONPARAMETRIC DIST	212	226
METHYLENE CHLORIDE	0 / 13	-	-	59 / 60	2.00 - 32.0	IB-SB-03-02	NONPARAMETRIC DIST	8.48	9.93
PHENANTHRENE	1 / 11	51.0	51	7 / 66	150.0 - 598	IW-SB-213-10	NONPARAMETRIC DIST	228	238
PYRENE	1 / 11	100	100	12 / 66	68.0 - 920	EA-SB-15-05	NONPARAMETRIC DIST	262	284
TETRACHLOROETHENE	0 / 20	-	-	28 / 126	1.00 - 12.0	IW-SB-176-08	NONPARAMETRIC DIST	6.12	6.37
TOLUENE	3 / 20	2.00	2.0	3 / 126	2.00 - 2.00	IW-SB-77-05	NONPARAMETRIC DIST	6.64	2.00
TRICHLOROETHENE	0 / 19	-	-	38 / 108	1 - 15	IW-SB-220-10	NONPARAMETRIC DIST	6.05	6.47

NOTES

Units are mg/kg for inorganics, ug/kg for organics.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Mean of all data Includes positive detections and non-detected results. Detection limits are divided by two.
The determination of representative concentrations is based on comparison of maximum to the 95 % UCL, which is presented in a separate table.
Frequency of detection refers to number of times compound was detected among all samples versus total number of samples.
Number of samples may vary based on the number of usable results.

TABLE 2

OCCURRENCE AND RANGE OF ORGANICS IN SUBSURFACE SOIL AT BUILDINGS 15/130
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
(ug/kg)

	BACKGROUND			SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
2-BUTANONE	0 / 20	-	-	3 / 4	5.00 - 21.0	15 /130-SB-29-06	LOGNORMAL OVER NORMAL	9.88	21.0
METHYLENE CHLORIDE	1 / 14	4.00	4.00	6 / 6	4.00 - 53.0	15/130-SB-13-08	LOGNORMAL OVER NORMAL	17.3	53.0
TETRACHLOROETHENE	0 / 20	-	-	5 / 7	1.00 - 7.00	15 /130-SB-29-06	NORMAL OVER LOGNORMAL	3.93	7.00
TRICHLOROETHENE	0 / 20	-	-	3 / 7	1.00 - 18.0	15 /130-SB-29-06	UNKNOWN DIST	6.21	18.0

TABLE 3
COMPARISON OF GROUNDWATER SOIL SCREENING LEVELS (SSLs) TO REPRESENTATIVE SOIL CONCENTRATIONS
NAWC WARMINSTER, PENNSYLVANIA

COPC	Groundwater SSL DAF 20 (µg/kg)	Building 15/130 Surface Soil RI Report Data (µg/kg)	Building 15/130 Surface Soil August 1998 Data (µg/kg)	Building 15/130 Subsurface Soil RI Report Data (µg/kg)	Area D Subsurface Soil RI Report Data (µg/kg)
1,1-Dichloroethene	60	ND	ND	ND	ND
Benzene	30	ND	ND	ND	ND
Carbon Disulfide	32000	ND	3.3	ND	ND
Carbon Tetrachloride	70	ND	ND	ND	ND
Tetrachloroethene	60	2600**	ND	7	6.37
Trichloroethene	60	23	ND	18	6.47

** = Representative concentration value exceeds Groundwater SSL. The representative concentration is equal to the maximum detection. All other samples range from ND to 10 µg/kg.
ND = Not Detected
SSLs based on dilution attenuation factor (DAF) of 20 (EPA, Soil Screening Technical Guidance Document, Appendix A, Table A-1. May 1996).

TABLE 4

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SUBSURFACE SOIL AT AREA D
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
(mg/kg)

	BACKGROUND			SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
ALUMINUM	31 / 31	4780 - 18100	15300	115 / 115	3530 - 21400	PB-SB-16-03	NONPARAMETRIC DIST	10100	10800
ARSENIC	27 / 31	0.28 - 12.1	10.5	64 / 66	2.00 - 20.6	L003-SB-20-06	NONPARAMETRIC DIST	4.02	4.67
BARIUM	27 / 29	34.1 - 225	73.5	92 / 92	46.2 - 304	IW-SB-128-07	NONPARAMETRIC DIST	98.7	106
BERYLLIUM	27 / 31	0.31 - 1.70	0.91	48 / 48	0.96 - 4.40	LD02-SB-05-16	NONPARAMETRIC DIST	1.65	1.80
CADMIUM	0 / 31	-	-	31 / 67	0.72 - 17.2	IW-SB-53-06	NONPARAMETRIC DIST	1.22	17.2
CALCIUM	25 / 29	240 - 1910	786	86 / 86	1030 - 30600	IB-SB-04-02	NONPARAMETRIC DIST	5580	6320
CHROMIUM	31 / 31	7.90 - 35.3	21.6	115 / 115	2.20 - 201	IB-SB-16-07	NONPARAMETRIC DIST	18.7	19.9
COBALT	27 / 30	1.60 - 22.1	11.1	45 / 45	8.60 - 44.2	LD02-SB-05-16	NONPARAMETRIC DIST	13.7	14.9
COPPER	29 / 31	3.60 - 30.6	14.0	100 / 101	4.60 - 180	IW-SB-206-07	NONPARAMETRIC DIST	20.3	22.9
IRON	31 / 31	6980 - 410500	33900	115 / 115	3530 - 47100	LD01-SB-01-06	NONPARAMETRIC DIST	16100	18000
LEAD	31 / 31	1.60 - 96.5	15.4	115 / 115	1.00 - 164	IW-SB-188-03	NONPARAMETRIC DIST	10.8	12.6
MAGNESIUM	27 / 31	518 - 4960	2270	107 / 107	943 - 14700	B02-SB-37-08	NONPARAMETRIC DIST	3420	3770
MANGANESE	31 / 31	30.9 - 2010	585	115 / 115	20.3 - 3180	IB-SB-21-04	NONPARAMETRIC DIST	524	724
MERCURY	1 / 28	0.37	0.05	2 / 103	0.10 - 0.12	IW-SB-189-04	NONPARAMETRIC DIST	0.03	0.03
NICKEL	20 / 27	4.10 - 21.7	12.2	77 / 78	6.80 - 36.0	IB-SB-20-05	NONPARAMETRIC DIST	13.6	15.2
POTASSIUM	27 / 29	89.1 - 3050	1040	34 / 34	1020 - 5520	IW-SB-102-09	NONPARAMETRIC DIST	2180	2520
SELENIUM	0 / 29	-	-	7 / 99	0.69 - 2.30	IW-SB-250-06	NONPARAMETRIC DIST	0.33	0.34
SILVER	0 / 26	-	-	2 / 82	2.20 - 2.20	IB-SB-04-02	NONPARAMETRIC DIST	0.62	0.68
THALLIUM	3 / 31	0.37 - 0.42	0.44	22 / 59	2.10 - 7.00	LD01-SB-01-06	NONPARAMETRIC DIST	1.58	2.48
VANADIUM	31 / 31	15.4 - 45.0	32.2	97 / 97	9.20 - 48.5	PB-SB-16-03	NONPARAMETRIC DIST	21.9	23.5
ZINC	27 / 29	9.00 - 60.0	32.6	115 / 115	3.80 - 252	IW-SB-188-03	NONPARAMETRIC DIST	25.7	28.8

TABLE 5

OCCURRENCE AND RANGE OF INORGANICS IN SUBSURFACE SOIL AT BUILDING 15/130
NAWC WAMINSTER, WARMINSTER, PENNSYLVANIA
(mg/kg)

	BACKGROUND				SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
ALUMINUM	31 / 31	4780 - 18100	13400	15300	5 / 5	5870 - 18800	15/130-SB-29-06	LOGNORMAL OVER NORMAL	9330	18800
ARSENIC	27 / 31	0.28 - 12.1	3.88	10.5	1 / 1	8.20 - 8.20	15/130-SB-29-06	UNKNOWN DIST	8.20	8.20
BARIUM	27 / 29	34.1 - 226	62	73.5	1 / 1	49.0 - 49.0	15/130-SB-29-06	UNKNOWN DIST	49.0	49.0
BERYLLIUM	27 / 31	0.31 - 1.70	0.81	0.91	1 / 2	1.30 - 1.30	15/130-SB-29-06	UNKNOWN DIST	0.70	1.30
CALCIUM	25 / 29	240 - 1910	964	786	4 / 4	922 - 1220	15/130-SB-29-06	LOGNORMAL OVER NORMAL	1070	1220
CHROMIUM	31 / 31	7.90 - 35.3	19	21.6	5 / 5	6.80 - 21.6	15/130-SB-29-06	LOGNORMAL OVER NORMAL	12.2	21.8
COBALT	27 / 30	1.60 - 22.1	8.90	11.1	1 / 1	11.7 - 11.7	15/130-SB-29-06	UNKNOWN DIST	11.7	11.7
COPPER	29 / 31	3.60 - 30.6	11.8	14.0	4 / 4	19.4 - 75.3	15/130-SB-13-06	NONPARAMETRIC DIST	34.8	75.3
IRON	31 / 31	6980 - 410500	33100	33800	5 / 5	5600 - 27100	15/130-SB-29-06	NONPARAMETRIC DIST	12300	27100
LEAD	31 / 31	1.60 - 96.6	11.7	15.4	5 / 5	0.98 - 15.2	15/130-SB-29-06	NONPARAMETRIC DIST	4.24	15.2
MAGNESIUM	27 / 31	518 - 4960	1980	2270	5 / 5	1030 - 2750	15/130-SB-29-06	LOGNORMAL OVER NORMAL	1680	2750
MANGANESE	31 / 31	30.9 - 2010	424	585	5 / 5	38.3 - 1110	15/130-SB-49-08	LOGNORMAL OVER NORMAL	377	1110
NICKEL	20 / 27	4.10 - 21.7	1.06	12.2	2 / 2	7.30 - 12.7	15/130-SB-29-06	UNKNOWN DIST	10.0	12.7
SELENIUM	0 / 29	-	-	-	1 / 2	1.20 - 1.20	15/130-SB-29-06	UNKNOWN DIST	0.69	1.20
THALLIUM	3 / 31	0.37 - 0.42	0.38	0.44	1 / 1	3.40 - 3.40	15/130-SB-29-06	UNKNOWN DIST	3.40	3.40
VANADIUM	31 / 31	15.4 - 45.0	29.7	32.2	4 / 4	12.9 - 37.1	15/130-SB-29-06	NONPARAMETRIC DIST	19.2	37.1
ZINC	27 / 29	9.00 - 60.0	27.7	31.3	5 / 5	7.30 - 45.6	15/130-SB-29-06	LOGNORMAL OVER NORMAL	18.9	46.5

also analyzed for metals. Table 6 and 7 present the occurrence and distribution of organic and inorganic contaminants identified in these samples. TCE, the primary constituent of concern in Area D groundwater, was detected in 6 samples at concentrations ranging from 2 ug/kg to 23 ug/kg. The EPA soil screening level for the protection of groundwater for TCE is 60 ug/kg. The only other Area D groundwater contaminant of concern identified in these soil samples was PCE. PCE was detected in 5 samples ranging from 2 ug/kg to 2,600 ug/kg. The groundwater protection level for PCE is 60 ug/kg. One sample contained PCE in excess of this screening level. The sample exceeding the screening level of 60 ug/kg for PCE contained 2,600 ug/kg. A further evaluation of soil data in the vicinity of the subject sample (15/130-SB-85-03) found that three surface and three subsurface soil samples were collected within 35 feet of the location of concern. None of these samples contained PCE at a concentration exceeding 10 ug/kg. Based on these data, the quantity of soil exceeding the screening level at this location is very limited.

No organic compounds were detected in surface soil samples at levels exceeding EPA soil screening levels protective of residential use.

Table 7 provides the occurrence and distribution of inorganics detected in the surface soil samples collected at Buildings 15 and 130 during the Rl. Vanadium was the only inorganic detected at levels above background and at levels above residential use screening levels. The maximum vanadium concentration detected was 46.2 mg/kg.

Additional surface soil samples were collected around Buildings 15 and 130 in July 1998. Six samples were collected from within the top 6 inches of soil and analyzed for VOCs, semi-volatile compounds pesticides/PCBs and metals. Table 8 presents the occurrence and distribution of organics and inorganics detected in these samples. None of the Area D groundwater contaminants of concern were detected in these 6 surface soil samples at levels exceeding EPA soil to groundwater screening levels (see Table 3). Three PAH compounds, benzo(a)anthracene, benzo(a)pyrene and benzo(a)fluoranthene, were detected at levels above the EPA screening level for residential use. The maximum concentrations detected were 1,400 ug/kg, 2,000 ug/kg, and 3,100 ug/kg, respectively.

Despite the exceedances, of screening levels discussed above, the Summary of Site Risks section to follow explains why it was determined that no organic or inorganic contaminants of concern (COCs) have been identified in surface soils within Area D.

D. Contaminant Migration

There is no surface water body in Area D. The majority of the area is covered with pavement and/or buildings. Surface water runoff and water from roof drains enter a series of on-base stormwater collection and management structures, The majority of stormwater from Area D drains to the north (NAWC Area A) and discharges to an unnamed tributary to Little Neshaminy Creek. This stream is being addressed

TABLE 6

OCCURRENCE AND DISTRIBUTION OF ORGANICS IN SURFACE SOIL AT BUILDING 15/130
NAWC WARMINSTER, WARMINSTER, PENNNSYLVANIA
(ug/kg)

	BACKGROUND			SITE-RELATED					
SUBSTANCE	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
1,2-DICHLOROETHENE (TOTAL)	0 / 20	-	-	2 / 7	2.00 - 2.00	15/130-SB-49-02	NONPARAMETRIC DIST	104	2.00
ANTHRACENE	0 / 11	-	-	1 / 7	44.0	15/130-SB-13-02	NONPARAMETRIC DIST	171	44.0
BENZ(A)ANTHRACENE	0 / 11	-	-	1 / 7	100	15/130-SB-13-02	NONPARAMETRIC DIST	179	100
BENZO(A)PYRENE	0 / 11	-	-	1 / 7	39.0	15/130-SB-13-02	NONPARAMETRIC DIST	171	39.0
BENZO(B)FLUORANTHENE	1 / 11	58.0	58.0	2 / 7	45.0 - 170	15/130-SB-13-02	NONPARAMETRIC DIST	168	170
BENZO(G,H,I)PERYLENE	0 / 11	-	-	1 / 7	56.0	15/130-SB-13-02	NONPARAMETRIC DIST	173	56.0
BENZO(K)FLUORANTHENE	1 / 11	46.0	46.0	1 / 7	58.0	15/130-SB-13-02	NONPARAMETRIC DIST	173	58.0
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 11	50.0	50.0	1 / 2	43.0	15/130-SB-85-03	UNKNOWN DIST	117	43.0
CHRYSENE	1 / 11	51.0	51.0	1 / 7	93.0	15/130-SB-13-02	NONPARAMETRIC DIST	178	93.0
DI-N-BUTYLPHTHALATE	0 / 11	-	-	1 / 7	42.0	15/130-SB-87-03	NONPARAMETRIC DIST	170	42.0
FLUORANTHENE	1 / 11	92.0	92.0	4 / 7	42.0 - 340	15/130-SB-13-02	LOGNORMAL OVER NORMAL	155	340
HEXACHLOROBUTADIENE	0 / 11	-	-	1 / 7	60.0	15/130-SB-85-03	NONPARAMETRIC DIST	174	60.0
INDENO(1,2,3-CD)PYRENE	0 / 11	-	-	1 / 7	57.0	15/130-SB-13-02	NONPARAMETRIC DIST	173	57.0
METHYLENE CHLORIDE	0 / 13	-	-	4 / 5	13.0 - 49.0	15/130-SB-13-02	LOGNORMAL	161	49.0
PHENANTHRENE	1 / 11	51.0	51.0	1 / 7	290	15/130-SB-13-02	NONPARAMETRIC DIST	206	234
PHENOL	0 / 11	-	-	1 / 6	390	15/130-SB-13-02	NONPARAMETRIC DIST	224	300
PYRENE	1 / 11	100	100	4 / 7	39.0 - 250	15/130-SB-13-02	NORMAL OVER LOGNORMAL	141	250
TETRACHLOROETHENE	0 / 20	-	-	5 / 7	2.00 - 26 00	15/130-SB-85-03	NONPARAMETRIC DIST	377	2600
TRICHLOROETHENE	0 / 20	-	-	6 / 7	2.0 - 23	15/130-SB-49-02	LOGNORMAL	111.0	23.0

TABLE 7

OCCURRENCE AND DISTRIBUTION OF INORGANICS IN SURFACE SOIL AT BUILDINGS 15/130
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA
(mg/kg)

SUBSTANCE	BACKGROUND			SITE-RELATED					
	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	REPRESENTATIVE CONCENTRATION	FREQUENCY OF DETECTION	RANGE OF POSITIVE DETECTION	LOCATION OF MAXIMUM	STATISTICAL DISTRIBUTION	MEAN CONCENTRATION	REPRESENTATIVE CONCENTRATION
ALUMINUM	31 / 31	4780 - 18100	15300	5 / 5	11900 - 21200	15/130-SB-49-02	LOGNORMAL OVER NORMAL	15400	21200
ARSENIC	27 / 31	0.28 - 12.1	10.5	5 / 5	3.20 - 9.00	15/130-SB-63-02	LOGNORMAL OVER NORMAL	5.60	9.00
BARIUM	27 / 29	34.1 - 225	73.5	2 / 2	48.9 - 60.9	15/130-SB-95-03	UNKNOWN DIST	54.9	60.9
CADMIUM	0 / 31	-	-	1 / 1	1.10 - 1.10	15/130-SB-49-02	UNKNOWN DIST	1.10	1.10
CALCIUM	25 / 29	240 - 1910	786	3 / 3	1150 - 1350	15/130-SB-49-02	LOGNORMAL OVER NORMAL	1240	1350
CHROMIUM	31 / 31	7.90 - 35.3	21.6	5 / 5	6.30 - 29.8	15/130-SB-49-02	LOGNORMAL OVER NORMAL	18.9	29.8
COPPER	29 / 31	3.60 - 30.6	14.0	5 / 5	7.50 - 50.1	15/130-SB-13-02	LOGNORMAL OVER NORMAL	25.1	50.1
IRON	31 / 31	6980 - 410500	33900	5 / 5	9020 - 28500	15/130-SB-49-02	LOGNORMAL OVER NORMAL	17600	28500
LEAD	31 / 31	1.60 - 96.5	15.4	5 / 5	1.70 - 11.8	15/130-SB-49-02	NORMAL OVER LOGNORMAL	7.50	11.8
MAGNESIUM	27 / 31	518 - 4960	2270	5 / 5	1480 - 2790	15/130-SB-63-02	LOGNORMAL OVER NORMAL	2080	2790
MANGANESE	31 / 31	30.9 - 2010	585	5 / 5	75.4 - 194	15/130-SB-49-02	LOGNORMAL OVER NORMAL	130	194
NICKEL	20 / 27	4.10 - 21.7	14.4	3 / 3	11.2 - 14.1	15/130-SB-49-02	LOGNORMAL OVER NORMAL	12.5	14.1
POTASSIUM	27 / 29	89.1 - 3050	1040	1 / 1	1050 - 1050	15/130-SB-49-02	UNKNOWN DIST	1050	1050
SELENIUM	0 / 29	-	-	2 / 4	1.20 - 1.60	15/130-SB-49-02	NORMAL OVER LOGNORMAL	0.81	1.60
THALLIUM	3 / 31	0.37 - 0.42	0.44	2 / 2	2.70 - 2.70	15/130-SB-49-02	UNKNOWN DIST	2.70	2.70
VANADIUM	31 / 31	15.4 - 45.0	32.2	4 / 4	20.7 - 46.2	15/130-SB-49-02	NORMAL OVER LOGNORMAL	32.2	46.2
ZINC	27 / 29	9.00 - 60.0	32.8	5 / 5	12.1 - 54.3	15/130-SB-63-02	LOGNORMAL OVER NORMAL	29.5	54.3

Table 8
Occurrence and Distribution of Organics and Inorganics in Surface Soil, Building 15/130
NAWC Warminster

	Background Data					Site-Related Data				
	Freq of	Range of Positive Detection		Mean of	Sampling Round and	Freq of	Range of Positive Detection		Mean of	Sampling Round and	Representative
Substance	Detection	Min.	Max.	All Data	Location of Maximum	Detection	Min.	Max.	All Data	Location of Maximum	Concentration
Aluminum	6/6	5300 -	11800 E	8030	SB-53	6/6	3290 -	13600	8400	SS-06	11400
Arsenic	6/6	0.55 -	6	2.44	SB-53	6/6	0.87 -	10.3	4.87	SS-06	10.3
Barium	6/6	57.2 -	163	95.5	SB-MA-01	6/6	19.8 -	86	61.3	SS-05	80.2
Beryllium	6/6	0.42 -	2	0.807	SB-53	6/6	0.49 -	3.9	1.52	SS-06	3.9
Cadmium	1/6	3 -	3	0.693	SB-53	3/6	2 -	3.4	1.62	SS-06	2.69
Calcium	6/6	307 -	1320	719	SB-53	6/6	1150 -	34200	11000	SS-03	34200
Chromium	6/6	7.5 -	20.5	13.3	SB-MA-02	6/6	5.7 -	80.3	36.5	SS-04	80.3
Cobalt	6/6	9 -	23.4	12	SB-MA-01	6/6	5.3 -	23.6	12.6	SS-04	23.2
Copper	6/6	4 **w** -	207 J	57.1	SB-MA-01	6/6	5.1 -	105	45.7	SS-04	105
Iron	6/6	6960 -	21000	12300	SB-55	6/6	5330 -	27700	19000	SS-06	25800
Lead	6/6	1.1 -	18	5.87	SB-53	6/6	2.3 -	235	112	SS-06	190
Magnesium	6/6	1360 -	2020	1590	SB-MA-01	6/6	933 -	21700	6850	SS-03	21700
Manganese	6/6	392 J -	791 J	570	SB-MA-01	6/6	320 -	703	542	SS-04	646
Mercury	1/5	0.08 J -	0.08 J	0.035	SB-53	2/6	0.28 -	41.7	7.04	SS-05	41.7
Nickel	3/6	10 -	19.7	9.57	SB-MA-02	6/6	4.6 -	57.3	25.3	SS-04	57.3
Potassium	4/6	149 -	321	173	SB-53	6.6	173 -	2140	1100	SS-03	1740
Silver	0/4		-			5/6	0.8 -	0.97	0.763	SS-02	0.97
Sodium	6/6	84.1 -	201 J	126	SB55	6/6	74.2 -	343	155	SS-04	289
Vanadium	6/6	11 -	28	19	SB-MA-02	6/6	6.8 -	46.5	28.5	SS-04	40.2
Zinc	6/6	5 -	38	14	SB-53	6/6	17 -	501	225	SS-04	501
Acenaphthene	0/0		-			2/6	79 J -	130 J	192	SS-05	130
Acenaphthylene	0/0		-			1/6	61 J -	61 J	233	SS-02	61
Anthracene	0/0		-			4/6	140 J -	500 J	235	SS-05	383
Benz(a)anthracene	0/0		-			5/6	130 J -	1400	716	SS-04	1120
Benzo(a)pyrene	0/0		-			5/6	180 J -	2000	918	SS-04	1480
Benzo(b)fluoranthene	0/0		-			5/6	190 J -	3100	1280	SS-04	2170
Benzo(g,h,i)perylene	0/0		-			5/6	100 J -	320 J	173	SS-04	269
Benzo(k)fluoranthene	0/0		-			5/6	170 J -	2000	944	SS-04	1520
Bis(2-ethylhexyl)phthalate	0/0		-			2/6	65 J -	100 J	184	SS-05	100
Carbazole	0/0		-			2/6	110 J -	170 J	203	SS-05	170

Table 8
Occurrence and Distribution of Organics and Inorganics in Surface Soil, Building 15/130
NAWC Warminster

	Background Data					Site-Related Data				
	Freq of	Range of Positive Detection		Mean of	Sampling Round and	Freq of	Range of Positive Detection		Mean of	Sampling Round and	Representative
Substance	Detection	Min.	Max.	All Data	Location of Maximum	Detection	Min.	Max.	All Data	Location of Maximum	Concentration
Chrysene	0/0	-				5/6	170 J	1700	826	SS-04	1310
Fluoranthene	0/0	-				5/6	210 J	2900	1620	SS-05	2600
Fluorene	0/0	-				2/6	80 J	170 J	198	SS-05	170
Indeno(1,2,3-cd)pyrene	0/0	-				5/6	110 J	420 J	214	SS-04	351
Naphthalene	0/0	-				1/6	47 J	47 J	230	SS-02	47
Phenanthrene	0/0	-				5/6	95 J	1800	735	SS-05	1800
Pyrene	0/0	-				5/6	230 J	2300	1390	SS-04	2180
2-Butanone	0/0	-				6/6	3.7 J	12 J	7	SS-10	10.6
Acetone	0/0	-				6/6	15 J	74	39.6	SS-02	74
Carbon Disulfide	0/0	-				2/6	1.6 J	3.3 J	2.64	SS-01	3.3
Toluene	0/0	-				1/6	2.3 J	2.3 J	2.58	SS-02	2.3

Notes:

Units are mg/kg for inorganics, ug/kg for organics.
Number of sample results excludes rejected data or blank-qualified data. Duplicates are consolidated into one result.
Mean of all data includes positive detections and non-detected results. Detection limits are divided by two.
The determination of representative concentrations is based on comparison of maximum to the 95 % UCL, which is presented in a separate table.
Frequency of detection refers to number of times compound was detected among all samples versus total number of samples.
Number of samples may vary based on the number of usable results.

under Operable Unit 9. Surface water runoff from the southwestern part of Area D drains to the south and discharges to the township stormwater system.

Groundwater contamination apparently attributable to releases within Area D is being addressed under OU-4. The primary contaminant of concern in Area D groundwater is TCE. An interim remedial action was implemented to address OU-4. As previously discussed, while TCE was frequently detected in Area D soils, no soil sample collected during the OU-8 RI contained TCE concentrations above the EPA soil screening level for protection of groundwater quality. These data indicate that soils investigated under the OU-8 RI are not a significant source of TCE in Area D groundwater. In addition, no other contaminants have been determined to present a threat to groundwater quality.

VII. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

OU-8 is located in the western portion of NAWC, west of Jacksonville Road and north of Street Road. The area consists of industrial and office type buildings, parking lots, and paved roadways. The subject property has been designated for transfer to the Federal Land Reuse Authority (FLRA) and local municipalities under an Economic Development Conveyance (EDC). The re-use plan for this area, prepared by the FLRA and approved by the local municipalities, identifies light industrial use as the designated use for this land. The area comprising OU-8 is anticipated to be used for an industrial office park complex.

VIII. SUMMARY OF SITE RISKS

The human health risks associated with exposure to contaminated media at OU-8 were evaluated in the RI Report. Although the site will remain in industrial use, a human health risk assessment was also performed on a hypothetical residential use scenario for informational purposes. In addition to the baseline risk assessment completed as part of the RI, a supplemental risk assessment, evaluating only the surface soil samples collected around Buildings 15 and 130 in July 1998, was prepared (TtNUS, May 2000).

As part of the RI, a risk assessment was conducted with available data to estimate the potential risks to human health posed by Area D soils. The primary objective of the RI was to determine whether any Area D soil may impact groundwater quality to an extent where the affected groundwater may present an unacceptable risk to human health. (TCE and other chlorinated VOCs are the known contaminants of concern in Area D groundwater.) The RI also assessed potential risks posed by the incidental ingestion and dermal contact with soils sampled during the RI. Finally, the RI assessed whether the intrusion of contaminant vapors from groundwater and soils into Building 1 and 2 may present an unacceptable risk to human health.

To assess the risk presented by soils to groundwater, soil contaminant concentrations were initially compared to soil screening criteria protective of groundwater quality for Area D groundwater contaminants of concern. The screening criteria were developed by EPA and are contaminant concentrations in soil that, if exceeded, may result in groundwater quality that presents an unacceptable non-carcinogenic or carcinogenic risk. If the screening criteria are exceeded, further evaluation should be performed with site-specific data or a response action should be undertaken. Only one soil sample collected during the RI exceeded these screening criteria. An evaluation of RI data for the area where this sample was collected found the detected concentration was isolated and not representative of a significant quantity of soil. As a result, based on the results of the screening process, it was determined that the soils characterized during the RI should not impact groundwater quality to an extent where the groundwater presents an unacceptable health risk.

A. Human Health Risk Assessment

Risks presented by direct contact with Area D soils were assessed in a quantitative manner for potential industrial, construction worker, and residential (children and adults) receptors. While residential land use is not reasonably anticipated, potential risks to future on-base residents were quantified for purposes of completeness. All potential future receptors were evaluated for exposure to surface soil and subsurface soils. The exposure routes were incidental ingestion of soil and dermal contact with soil.

Exposure Assessment

Potential exposure point concentrations were assumed to be representative concentrations discussed in Section VI.

Toxicity Assessment

The toxicity assessment characterizes the nature and magnitude of potential health effects associated with human exposure to COPCs at a site. Quantitative risk estimates for each COPC and exposure pathways are developed by integrating chemical-specific toxicity factors with estimated chemical intakes discussed in the previous section.

Quantitative risk estimates are calculated using cancer slope factors (CSFs) for COPCs exhibiting carcinogenic effects and reference doses (RfDs) for COPCs exhibiting systemic (noncarcinogenic) effects. A summary of the RfDs and CSFs, used in the baseline human health risk assessment is presented in Table 9.

Reference Doses

As defined in the Integrated Risk Information System (IRIS), an RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime. RfDs are developed for chronic and/or subchronic human exposure to hazardous chemicals and are based on the assumption that thresholds exist for certain toxic effects. The RfD is usually expressed as an acceptable dose (in mg) per unit body weight (in kg) per unit time (in days). The RfD is derived by dividing the no-observed-adverse-effect level (NOAEL) or the lowest-observed-adverse-effect level (LOAEL) by an uncertainty factor multiplied by a modifying factor. The use of uncertainty factors and modifying factors is discussed in IRIS (EPA, 1995) and in HEAST (EPA, 1994).

The uncertainty factor used to calculate the RfD reflects scientific judgment regarding the various types of data used to estimate RfD values. An uncertainty factor of 10 is typically used to account for variation in human sensitivity, extrapolating from valid human studies involving subchronic (for subchronic RfDs) or long-term (for chronic RfDs) exposure of average, healthy subjects. An additional 10-fold factor is typically used for each of the following extrapolations: from long-term animal studies to the case of humans, from a LOAEL to a NOAEL, and from subchronic studies to a chronic RfD. An additional uncertainty factor or modifying factor, ranging from less than zero to up to ten, is applied to reflect any professional assessment of the uncertainties of the study and database (such as completeness of the overall database) not explicitly addressed by these uncertainty factors. The default value for this modifying factor is 1.0.

Cancer Slope Factors

CSFs are used to estimate the lifetime (assuming a 70-year lifespan) probability of human receptors contracting cancer as a result of exposure to known or suspected carcinogens. The factor is generally reported in units of $(mg/kg/day)^{-1}$ and is derived using assumed low-dosage responses determined based on human or animal studies. Cancer risk and CSFs are most commonly estimated through the use of a linearized, multistage mathematical extrapolation model applied to animal bioassay results. The value used to report the slope factor was the upper 95 percent confidence limit.

Toxicity Criteria for the Dermal Route of Exposure

The toxicity criteria for the evaluation of the dermal route of exposure were derived using the guidance presented in Appendix A of the Risk Assessment Guidance for Superfund, Volume I - Human Health

TABLE 9

REFERENCE DOSES, CANCER SLOPE FACTORS, RBCs AND SSLs
FOR ALL COMPOUNDS IN ALL OF AREA D
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

COMPOUND	Representative Concentration mg/kg	Mean Concentration mg/kg	RfDo mg/kg/d		RfDi mg/kg/d		CPSo kg·d/mg		CPSi kg·d/mg		Soil Ingestion Industrial mg/kg		Soil Ingestion Residential mg/kg	
BERYLLIUM	1.30 - 1.80	0.70 - 1.65	5.00E-03	I			4.30E+00	I	8.40E+00	I	1.3	C	0.15	C
VANADIUM	37.1 - 46.2	19.2 - 32.2	7.00E-03	H							14000	N	550	N
BENZO(A)PYRENE	0.2370 - 0.2370	0.2220 - 0.2220					7.30E+00	I	6.10E+00	w	0.78	C	0.088	C

Sources; I=IRIS H=HEAST A=HEAST alternate W=Withdrawn from IRIS or HEAST
Basis: C=carcinogenic effects N=noncarcinogenic effects

Evaluation Manual (Part A) (EPA 1989). EPA Region III gastrointestinal absorption factors were used to derive the toxicity criteria for the dermal route of exposure.

Toxicity Criteria for the Carcinogenic Polynuclear Aromatic Hydrocarbons (PAHs)

The toxicity equivalence factor (TEF) approach to evaluating carcinogenic PAHs detected in the environmental media was used for this report. This approach is described in the Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons (EPA 1993).

B. Risk Characterization

Excess lifetime cancer risks are determined by multiplying the intake level and the Cancer Slope Factor (CSF). These risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70 year lifetime, under the specific exposure conditions at a site.

Noncarcinogenic risks are estimated using the concept of the hazard quotient (HQ) and the hazard index (HI). The HQ is the ratio of the estimated intake and the RfD for a selected chemical of concern. HIs are the sums of the individual HQs for the COPCs. If the value of the HQ or the HI exceeds unity (1.0), the potential for noncarcinogenic health risks associated with exposure to that particular chemical or particular chemical mixture, respectively, are considered unacceptable (EPA, 1986b). If the individual HQs are less than 1.0 and the HI is greater than 1.0, particular attention should be paid to the target organ(s) affected by each chemical because these are generally the organ(s) associated with RfD-derived effects, and toxicity for different organs is not truly additive. The HI is not a mathematical prediction of the severity of toxic effects; it is simply a numerical indicator of the possibility of the occurrence of noncarcinogenic (threshold) effects.

The risk assessment presented in the RI Report (TtNUS, 1998) evaluated beryllium as a potential carcinogen. The risk estimates were prepared using cancer reference dose data available from the Integrated Risk Information System (IRIS) at the time of the evaluation. At that time IRIS listed oral and dermal reference dose information for beryllium, as it was classified by EPA, as a Group B2 carcinogen (sufficient evidence of carcinogenicity in animals; inadequate evidence of carcinogenicity in humans). Since the time that the evaluation was completed, EPA has reclassified beryllium and updated IRIS to reflect that it no longer, based on evaluation of available data, considers beryllium a cancer threat by dermal contact or ingestion. The latest IRIS subsection regarding the Quantitative Estimate of Carcinogenic Risk From Oral Exposure to Beryllium states that, "The oral database ... previously used in the development of the oral slope factor on IRIS, is considered inadequate for the assessment of

carcinogenicity. The basis for not using the Schroeder and Mitchener rat study (1975a) is that the incidences of gross or malignant tumors in the control and beryllium-exposed groups were not significantly different."

Based on this change in classification, the estimated cancer risk calculations that considered beryllium a carcinogen for the OU-8 baseline risk assessment contained in the RI Report for Area D Sources (TtNUS, 9/98) have been revised. These revised risks are documented in a letter report, Revised Human Health Risks Area D Sources Other than Groundwater, (TtNUS, March 28, 2000). Table 10 presents the cancer risks estimated for the three receptors evaluated and presents the revised risks.

The cancer risks for all three receptors (resident, industrial worker, and construction worker) are within or less than EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6} . The incremental lifetime cancer risk for residential exposure to Area D subsurface soils is 7.2×10^{-6}. The estimated industrial exposure cancer risk is 6.7×10^{-7} and the construction worker risk is 2.3×10^{-7}. There is no estimated cancer risk posed by Buildings 15 and 130 surface or subsurface soils, based on the RI data, because no carcinogenic COPCs were identified.

Tables 11 through 13 present the noncancer risks associated with Area D and Buildings 15 and 130 soils for all three receptors based on the RI data. The HI for each receptor and each medium is less than 1.

A supplemental risk assessment evaluating the shallow (0 to 6 inches below the ground surface) surface soil samples collected in July 1998 was performed to further assess potential risks associated with surface soils surrounding Buildings 15 and 130 (TtNUS, May 2000). Tables 14 and 15 present the lifetime cancer risks for the potential residential and industrial users. The lifetime cumulative residential cancer risk is 2.07×10^{-5} and the industrial user estimated cancer risk is 4.6×10^{-6}. Both of these incremental cancer risks are within the EPA target risk range. Noncarcinogenic risks were not calculated because no noncarcinogenic COPCs were identified in the surface soil samples.

The RI also included an evaluation of the potential carcinogenic risks associated with the possible intrusion of volatile organic vapors into Buildings within Area D. As part of this evaluation, a numerical model was used to approximate the extent of organic vapors which may migrate from Area D soils and groundwater into Buildings 1 and 2. The model predicted a cumulative carcinogenic risk from groundwater vapor intrusion of 5.8×10^{-7} for TCE and 1.2×10^{-9} for PCE. Predicted cumulative carcinogenic risks from soil vapor-phase intrusion were 8.3×10^{-9} for TCE and 4.5×10^{-9} for PCE. In each case the predicted in cremental carcinogenic risks were well below the acceptable range established by EPA.

TABLE 10
Reasonable Maximum Exposure (RME)
Carcinogenic Risk to Potential Future Receptors
Area D Soils, OU-8, RI Baseline Risk Assessment
NAWC Warminster, Pennsylvania

FUTURE RESIDENTIAL USER

Media	Incremental Risk	
	INGESTION	**DERMAL**
Area D Subsurface Soils	**2.7×10^{-6}**	**4.5×10^{-6}**
Buildings 15 and 130 Subsurface Soils	**0.0**	**0.0**
Buildings 15 and 130 Surface Soils (0 to 3 feet, from RI)	**0.0**	**0.0**

FUTURE INDUSTRIAL WORKER

Media	**Incremental Risk**	
	INGESTION	**DERMAL**
Area D Subsurface Soils	**6.0×10^{-7}**	**7.5×10^{-8}**
Buildings 15 and 130 Subsurface Soils	**0.0**	**0.0**
Buildings 15 and 130 Surface Soils (0 to 3 feet, from RI)	**0.0**	**0.0**

FUTURE CONSTRUCTION WORKER

Media	**Incremental Risk**	
	INGESTION	**DERMAL**
Area D Subsurface Soils	**1.2×10^{-7}**	**8.3×10^{-8}**
Buildings 15 and 130 Subsurface Soils	**0.0**	**0.0**
Buildings 15 and 130 Surface Soils (0 to 3 feet, from RI)	**0.0**	**0.0**

TABLE 11

RME NONCARCINOGENIC HQS, FUTURE RESIDENT RECEPTORS - AREA D
SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - LIFETIME	SUBSURFACE SOIL DERMAL CONTACT - LIFETIME
BERYLLIUM	1.3E-03	2.2E-02
BENZO(A)PYRENE	NA	NA
HAZARD INDEX	1.3E-03	2.2E-02

RME NONCARCINOGENIC HQS, FUTURE RESIDENT RECEPTORS - AREA D
SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
BERYLLIUM	3.5E-04	4.4E-04
BENZO(A)PYRENE	NA	NA
HAZARD INDEX	3.5E-04	4.4E-04

RME NONCARCINOGENIC HQS, FUTURE RESIDENT RECEPTORS - AREA D
SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
BERYLLIUM	1.7E-03	1.2E-02
BENZO(A)PYRENE	NA	NA
HAZARD INDEX	1.7E-03	1.2E-02

N/A = NOT APPLICABLE, NO TOXICITY VALUE HAS BEEN ESTABLISHED FOR THIS CHEMICAL

TABLE 12

RME NONCARCINOGENIC HQS, FUTURE RESIDENT RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - LIFETIME	SUBSURFACE SOIL DERMAL CONTACT - LIFETIME
BERYLLIUM	9.5E-04	2.0E-02
VANADIUM	1.9E-02	8.0E-05
HAZARD INDEX	2.0E-02	2.0E-02

RME NONCARCINOGENIC HQS, FUTURE INDUSTRIAL RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
BERYLLIUM	2.5E-04	2.2E-04
VANADIUM	5.2E-03	9.1E-05
HAZARD INDEX	5.4E-03	3.1E-04

RME NONCARCINOGENIC HQS, FUTURE CONSTRUCTION RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
BERYLLIUM	1.2E-03	8.8E-03
VANADIUM	2.5E-02	3.6E-05
HAZARD INDEX	2.6E-02	8.8E-03

TABLE 13

RME NONCARCINOGENIC HQS, FUTURE RESIDENT RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - LIFETIME	SUBSURFACE SOIL DERMAL CONTACT - LIFETIME
VANADIUM	2.4E-02	9.9E-05
HAZARD INDEX	2.4E-02	9.9E-05

RME NONCARCINOGENIC HQS, FUTURE INDUSTRIAL RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
VANADIUM	6.5E-03	1.6E-06
HAZARD INDEX	6.5E-03	1.6E-06

RME NONCARCINOGENIC HQS, FUTURE CONSTRUCTION RECEPTORS
BUILDINGS 15/130 SUBSURFACE SOIL
NAWC WARMINSTER, WARMINSTER, PENNSYLVANIA

SUBSTANCE	SUBSURFACE SOIL INGESTION - ADULT	SUBSURFACE SOIL DERMAL CONTACT - ADULT
VANADIUM	3.1E-02	4.0E-05
HAZARD INDEX	3.1E-02	4.0E-05

TABLE 14

CALCULATION OF CANCER RISKS - LIFETIME RESIDENT CONTACT (ING. & DER.) WITH BUILDING 15/130 SURFACE SOIL

REASONABLE MAXIMUM EXPOSURE

NAWC WARMINSTER

Scenario Timeframe: Future
Medium: Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Contact (Ing. & Der.) with Building 15/130 Surface Soil
Receptor Population: Lifetime Resident
Receptor Age: Child/Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benz(a)anthracene	1.12E+03	ug/kg	1.12E+03	ug/kg	M	1.75E-06	mg/kg-day	7.30E-01	1(mg/kg-day)	1.28E-06
	Benzo(a)pyrene	1.48E+03	ug/kg	1.48E+03	ug/kg	M	2.32E-06	mg/kg-day	7.30E+00	1(mg/kg-day)	1.69E-05
	Benzo(b)fluroranthene	2.17E+03	ug/kg	2.17E+03	ug/kg	M	3.40E-06	mg/kg-day	7.30E-01	1(mg/kg-day)	2.48E-06
	(Total)										2.01E-05
Dermal Absorption	Benz(a)anthracene	1.12E+03	ug/kg	1.12E+03	ug/kg	M	1.64E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	Benzo(a)pyrene	1.48E+03	ug/kg	1.48E+03	ug/kg	M	2.17E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	Benzo(b)fluoranthene	2.17E+03	ug/kg	2.17E+03	ug/kg	M	3.18E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	(Total)										- -
										Total of Routes	2.07E-05

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

TABLE 15
CALCULATION OF CANCER RISKS - INDUSTRIAL WORKER CONTACT (ING. & DER.) WITH BUILDING 15/130 SURFACE SOIL
REASONABLE MAXIMUM EXPOSURE
NAWC WARMINSTER

Scenario Timeframe: Future
Medium Surface Soil
Exposure Medium: Surface Soil
Exposure Point: Contact (Ing. & Der.) with Building 15/130 Surface Soil
Receptor Population: Industrial Worker
Receptor Age: Adult

Exposure Route	Chemical of Potential Concern	Medium EPC Value	Medium EPC Units	Route EPC Value	Route EPC Units	EPC Selected for Risk Calculation (1)	Intake (Cancer)	Intake (Cancer) Units	Cancer Slope Factor	Cancer Slope Factor Units	Cancer Risk
Ingestion	Benz(a)anthracene	1.12E+03	ug/kg	1.12E+03	ug/kg	M	3.91E-07	mg/kg-day	7.30E-01	1(mg/kg-day)	2.86E-07
	Benzo(a)pyrene	1.48E+03	ug/kg	1.48E+03	ug/kg	M	5.17E-07	mg/kg-day	7.30E+00	1(mg/kg-day)	3.78E-06
	Benzo(b)fluroranthene	2.17E+03	ug/kg	2.17E+03	ug/kg	M	7.58E-07	mg/kg-day	7.30E-01	1(mg/kg-day)	5.54E-07
	(Total)										4.61E-06
Dermal Absorption	Benz(a)anthracene	1.12E+03	ug/kg	1.12E+03	ug/kg	M	1.22E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	Benzo(a)pyrene	1.48E+03	ug/kg	1.48E+03	ug/kg	M	1.61E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	Benzo(b)fluoranthene	2.17E+03	ug/kg	2.17E+03	ug/kg	M	2.37E-06	mg/kg-day	- -	1(mg/kg-day)	- -
	(Total)										- -
										Total of Routes	4.61E-06

(1) Specify Medium-Specific (M) or Route-Specific (R) EPC selected for risk calculation.

IX. SELECTED REMEDY

The results of the risk assessment and the RI indicate that, based on available information, soils in Area D do not present an unacceptable risk to human health and the environment. In this case, the Navy, with the support EPA, selects a remedy of no action. There are no costs associated with this remedy. Based on available information, the Navy and EPA believe that this remedy is protective of human health and the environment and is cost-effective.

A. Documentation of Significant Changes

The No Action determination was presented in the Proposed Remedial Action Plan and was presented to the public at the public meeting held May 11, 2000.

No changes were made to the No Action determination presented in the Proposed Plan.

X. RESPONSIVENESS SUMMARY

Since 1988, the plans and results of CERCLA investigations and actions have been presented to a Technical Review Committee or a Restoration Advisory Board (RAB) that have been established by the Navy for the Site. Members of the RAB at this time include representatives of the Bucks County Health Department Northampton Township, Northampton Township Municipal Authority, Warminster Township Municipal Authority, Warminster Township, and Ivyland Borough.

An announcement of the public meeting, the comment period, and the availability of the Administrative Record for the proposed remedy for OU-8 was issued on May 11, 2000 in the Philadelphia Inquire, Intelligencer , and Courier Times. Additionally, the Proposed Plan and the Notice of Availability were mailed to local municipal and government agencies and residents in the vicinity of the Site.

The public comment period for the Proposed Plan was from May 1, 2000 to May 31, 2000. A public meeting was held at the North American Technology Center, 626 Jacksonville Road, Warminster, Pennsylvania, on May 11, 2000 to present the RI and Proposed Plan, answer questions, and solicit and accept both oral and written comments. Approximately 20 individuals attended and no oral or written comments were received during this availability session.

Since no comments were received during the public comment period, a Responsiveness Summary has not been prepared as part of this ROD. Upon signing the ROD, the Navy will publish a notice of availability of

this ROD in the Philadelphia Inguirer, Intelligencer, and Courier Times and place the ROD in the Administrative Record located at the repositories mentioned above.

This Record of Decision presents the selected remedy of no action for OU-8 chosen in accordance with CERCLA and, to the extent practicable, the National Contingency Plan (NCP).